

612.40260X00  
4689/00/JC

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Emmanuel DURET et al  
Serial No.: To Be Assigned  
Filed: July 6, 2001  
For: METHOD AND SYSTEM INTENDED FOR REAL-TIME  
ESTIMATION OF THE FLOW MODE OF A MULTIPHASE  
FLUID STREAM AT ALL POINTS OF A PIPE  
Art Unit: To Be Assigned  
Examiner:

**PRELIMINARY AMENDMENT**

Assistant Commissioner  
for Patents  
Washington, D. C. 20231

July 6, 2001

Sir:

Prior to examination of the above-identified application,  
please amend the claims as follows:

**IN THE CLAIMS:**

1) (Amended) A method of real-time estimation of a flow  
mode, at all points of a pipe whose structure can be defined by a  
number of structure parameters, of a multiphase fluid stream  
defined by physical quantities and comprising at least a liquid  
phase and at least a gas phase, the method comprising:

forming a non-linear neural network with an input layer  
having as many inputs as there are structure parameters and

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physical quantities, an output layer with as many outputs as there are quantities necessary for estimation of the flow mode and at least one intermediate layer;

creating a learning base with predetermined tables connecting values obtained for the output data to corresponding values of the input data; and

determining by iterations weighting factors of activation function allowing connection of the values in input and output data tables.

2) (Amended) A method as claimed in claim 1, further comprising:

analyzing the output data of the neural network to allow sorting, among the values of the output data of the neural network, only data to be taken into account in the iterative determination of weighting coefficients of the activation function.

3) (Amended) A method as claimed in claim 1, wherein:  
a totally connected network is formed.

4) (Amended) A method as claimed in claim 1, wherein:  
output neurons are linear.

5) (Amended) A method as claimed in claim 1, wherein:

the activation function is an identity function.

6) (Amended) A system providing real-time estimation of a flow mode, at all points of a pipe whose structure can be defined by structure parameters, of a multiphase fluid stream defined by physical quantities and comprising at least a liquid phase and at least a gas phase, the system comprising:

means for determining characteristics of a non-linear neural network with an input layer having as many inputs as there are structure parameters and physical quantities, an output layer having as many outputs as there are quantities necessary for estimation of the flow mode and at least one intermediate layer;

means for storing a learning base with predetermined tables connecting values obtained for the output data to corresponding values of the input data; and

means for determining by iterations weighting factors of an activation function allowing connection of the values in input and output data tables.

7) (Amended) A system as claimed in claim 6, comprising:

means for analyzing the output data of the neural network allowing sorting, among the values of the output data of the neural network, only data to be taken into account in the

iterative determination of weighting coefficients of the activation function.

- 8) (New) A method as claimed in claim 2, wherein:  
a totally connected network is formed.
- 9) (New) A method as claimed in claim 2, wherein:  
output neurons are linear.
- 10) (New) A method as claimed in claim 3, wherein:  
output neurons are linear.
- 11) (New) A method as claimed in claim 8, wherein:  
output neurons are linear.
- 12) (New) A method as claimed in claim 2, wherein:  
the activation function is an identity function.
- 13) (New) A method as claimed in claim 3, wherein:  
the activation function is an identity function.
- 14) (New) A method as claimed in claim 8, wherein:  
the activation function is an identity function.

REMARKS

The claims have been amended to remove the multiple dependent claims before filing fee calculation.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (612.40260X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP



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Attachment

DES:dlh

VERSION WITH MARKINGS TO SHOW CHANGES  
TO PRELIMINARY AMENDMENT

IN THE CLAIMS:

1) (Amended) A method ~~intended for~~ of real-time estimation of ~~the~~ a flow mode, at all points of a pipe whose structure can be defined by a ~~certain~~ number of structure parameters, of a multiphase fluid stream defined by ~~several~~ physical quantities and comprising at least a liquid phase and at least a gas phase, ~~characterized in that it comprises~~ the method comprising:

[-]forming a non-linear neural network with an input layer having as many inputs as there are structure parameters and physical quantities, an output layer with as many outputs as there are quantities necessary for estimation of the flow mode and at least one intermediate layer<sub>7i</sub>

[-]creating a learning base with predetermined tables connecting ~~various~~ values obtained for the output data to ~~the~~ corresponding values of the input data<sub>7i</sub> and

[-]determining by iterations weighting factors of the activation function allowing ~~to properly connect~~ connection of ~~the~~ values in ~~the~~ input and output data tables.

2) (Amended) A method as claimed in claim 1, further comprising:

~~analysing~~ analyzing the output data of the neural network ~~so as to allow to sort~~ sorting, among the values of the output data of the neural network, only ~~the pertinent~~ data to be taken into account in the iterative determination of ~~the~~ weighting coefficients of the activation function.

3) (Amended) A method as claimed in claim 1, ~~or 2,~~ characterized in that wherein:

a totally connected network is formed.

4) (Amended) A method as claimed in ~~any one of claims 1 to 3,~~ characterized in that the claim 1, wherein:

output neurons are linear.

5) (Amended) A method as claimed in ~~any one of claims 1 to 3,~~ characterized in that claim 1, wherein:

the activation function is an identity function.

6) (Amended) A system ~~intended for providing~~ providing real-time estimation of ~~the a~~ flow mode, at all points of a pipe whose structure can be defined by ~~a certain number of~~ structure parameters, of a multiphase fluid stream defined by ~~several~~ physical quantities and comprising at least a liquid phase and at least a gas phase, ~~characterized in that it comprises:~~ the system comprising:

[-] means for determining characteristics of a non-linear neural network with an input layer having as many inputs as there are structure parameters and physical quantities, an output layer having as many outputs as there are quantities necessary for estimation of the flow mode and at least one intermediate layer<sub>7i</sub>

[-]means for storing a learning base with predetermined tables connecting ~~various~~ values obtained for the output data to ~~the~~ corresponding values of the input data<sub>7i</sub> and

[-]means for determining by iterations weighting factors of an activation function allowing ~~to properly connect~~ connection of the values in ~~the~~ input and output data tables.

7) (Amended) A system as claimed in claim 6, comprising:

means for ~~analysing~~ analyzing the output data of the neural network allowing ~~to sort~~ sorting, among the values of the output data of the neural network, only ~~the pertinent~~ data to be taken into account in the iterative determination of ~~the~~ weighting coefficients of the activation function.

8) (New) A method as claimed in claim 2, wherein:

a totally connected network is formed.

9) (New) A method as claimed in claim 2, wherein:

output neurons are linear.



- 10) (New) A method as claimed in claim 3, wherein:  
output neurons are linear.
- 11) (New) A method as claimed in claim 8, wherein:  
output neurons are linear.
- 12) (New) A method as claimed in claim 2, wherein:  
the activation function is an identity function.
- 13) (New) A method as claimed in claim 3, wherein:  
the activation function is an identity function.
- 14) (New) A method as claimed in claim 8, wherein:  
the activation function is an identity function.